SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)
Syllabus with effect from the Academic Year 2024-2025

B.Sc. (Biotechnology) Sem.- III

Course Code	US03MABTE01	Title of the Course	Molecular Biology (Prokaryotes)
Total Credits of the Course	04	Hours per Week	04

Course Objectives	1.The students will learn about the molecular mechanism- replication, transcription and translation of Prokaryotes 2. To give an idea about various Prokaryotes enzymes and vectors used in genetic engineering.

	Course Content	Weightage*(%)
Unit 1	**Introduction to Prokaryotic replication** Central dogma of molecular biology. Replication-definition property and features and significance of Replication. Enzyme and Proteins involved in replication. Unidirectional and bidirectional replication. Closed clamp and rolling circle model. Initiation, elongation and termination of replication. Regulation of replication.	25
Unit 2	**Transcription and regulation** Definition and concept of gene promoter. Initiation, elongation and termination and anti-termination of transcription. Rho dependent and independent termination. Inhibitor of transcription of with a suitable example. Regulation of transcription –Lac operon and trp Operon.	25
Unit 3	**Overview of Translation** Role of mRNA, tRNA and rRNA in Protein synthesis. Amino acylation of tRNA. Ribosome formation of initiation complex, elongation and termination. Overview of post modification of Proteins.	25
Unit 4	**Prokaryotic Enzyme and Vectors used in Genetic engineering** Tools of recombinant technique-Restriction enzyme source, classes, nomenclature and application of restriction enzyme. Host controlled restriction and modification system in bacteria. Ligation properties, types and function of DNA ligase. Introduction to linkers and adaptors. Vector –definition, properties and bacterial vectors (Bacteriophage lambda, M13, pBR322, pUC18).	25

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.

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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	The students will study about Prokaryotic mechanism and various enzymes of replication
2.	The students will understand about role of RNA s in transcription and also about mechanism and regulation of prokaryotic transcription.
3.	The students will have an overview of translation.
4.	The student will have idea about various prokaryotic enzymes and vectors in genetic engineering.

Suggested References:	
Sr No	References 1. Principles of Biochemistry- Lehninger 2. Molecular Biology of the gene- J.D.Watson 3. Genetic engineering- S.Rastogi and N. Pathak 4. Expanding Horizon of Biotechnology – B.D Singh 5. Molecular Cell Biology- Lodish

On-line resources to be used if available as reference material
On-line Resources
Relevant entries on Wikipedia and Encyclopaedia Britannica

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B.Sc. (Biotechnology) Sem.- III

Course Code	US03MABTE02	Title of the Course	Fundamental of Microbiology
Total Credits of the Course	04	Hours per Week	04

Course Objectives	1. To understand basic concepts, classification and structure of microbial world. 2. To understand nutritional requirements, media and environment condition for growth of microorganism 3. To study antimicrobial agents and chemotherapeutic agent.

Course Content		
Unit	**1. Introduction to prokaryotes** Difference between Prokaryotes and Eukaryotes, distribution of Prokaryotes in nature, contribution of pioneers (Antony Van Leuwenhoek, Louis Pasteur, and Robert Koch), Members of Microbial world- Archea, Bacteria, Protozoa, algae, fungi and virus. Major characteristic for classifying bacteria, General methods of classifying Bacteria (intuitive method, numerical method, genetic relatedness), Introduction to Bergey's Manual.	Weightage*(%) 25
Unit	2. **Prokaryotic cell structure and function and staining** Size, Shape, arrangement of Bacterial Cell, Bacterial structure: External (Cell wall, Envelope, Pili, Flagella, Capsule/Sheath/ Prostheca) overview of Internal structures. Importance of staining dyes and stain. Preparation of smear, fixation, mordant, decolourizer. Simple staining (Monochrome and negative staining), Differential staining (Grams staining), special staining (endospore)	25
Unit	3. Nutritional requirements of microorganism, nutritional types of bacteria. Physical condition required for bacterial growth (pH, temperature, gaseous requirements). Normal Growth Curve. Definition of Pure culture and Axenic culture, Media general ingredients used in media, classification of media on the basis of nature and consistency and use. Techniques for isolation for Pure Culture. Overview of preservation of culture.	25
Unit	4. Concepts of sterilization, Characteristic of antimicrobial agents, Condition influencing antimicrobial agent, ideal characteristic of Chemical agent, , Chemical antimicrobial agents(phenol, Alcohol, Halogen, Surfactants, Heavy metals), phenol coefficient test Physical antimicrobial Agents (temperature, filtration, osmotic pressure, Radiation). Introduction to Chemotherapeutic agents and chemotherapy.	25

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Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate,Seminar, Quizzes Methodology

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
		15%
		15%
		70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	The students will get an overview on Prokaryotic life. Understand the major group of microbes and microbial classification and taxonomy.
2.	The student will learn to identify morphology and nutritional criteria of bacteria And microscopic techniques to study the structure.
3.	To learn the concepts and Isolation of Pure culture, and various media used and laboratory techniques to study microbes.
4.	The student will understand various concept and types of antimicrobial agents and chemotherapeutic agent.

Suggested References:	
Sr No	References
	Microbiology - Michael J Pelczar ,E.C.S. Chan, Noel R Krieg Microbiology - Prescott, Harley and Klein's Elementary Microbiology – H A Modi Microbiology –R M Atlas General Microbiology Vol 1 andVol 2 -Powar & Daginawala

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B.Sc. (Biotechnology) Sem.- III

Course Code	US03MABTE03	Title of the Course	Practicals
Total Credits of the Course	04	Hours per Week	08

Course Objectives	1. The students will get a practical approach for isolating and Characterization for identification of various microbes. 2. They will see the effect of various antimicrobial agents on microorganism 3. Learn staining techniques for study of microbes 4. The students will learn various isolation techniques for studying microbes.

Course Content		
Section-I	1. Quantitative and Qualitative analysis of Soil and Air micro flora. 2. Study of Pure Culture (*E.coli and Bacillus subtilis*) 3. study the effect of U.V on Pigment production of *Serratia marcescens.* 4. Isolation and identification of Fungi and Yeast. 5. study the effect of Heavy metals on growth of microorganism 6. Isolation of Genomic DNA from *E.coli*. 7. Isolation of RNA from Prokaryotes	
Section-II	1. Isolation of microorganism from soil sample by streak/spread/pour plate method. 2. Simple staining-Monochrome and negative staining 3. Differential staining-Gram's staining 4. Special staining-Endospore staining 5. Effect of pH and temperature on growth of microorganism. 6. Study of antimicrobial agent (Paper disc method) 7. Staining of chromosome. (G banding) 8. Seminar/poster presentation	

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Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
	1. The students will learn various isolation technique and I identification of various major classes of microorganism 2. To Enumerate microorganism from different sources 3. The students will study Biochemical tes and growth characteristic of pure culture. 4. The students will learn isolate nucleic acid from prokaryotes 5. They will learn effect of antimicrobial agents on microbes.

Suggested References:	
Sr No	References 1. Experimental microbiology (Vol. 1 & 2) by Rakesh Patel 2. Molecular cloning (Vol. 1,2,3) by Sambrook et.al

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B.Sc. (Biotechnology) Sem.- III

Course Code	US03IDBTE01	Title of the Course	Basics of Microbiology
Total Credits of the Course	02	Hours per Week	02

Course Objectives	1. To understand structure of microbial world. 2. To understand nutritional requirements, media and environment condition for growth of microorganism

Course Content		
		Weightage*(%)
Unit 1	**Prokaryotic cell structure and function and staining** Size, Shape, arrangement of Bacterial Cell, Bacterial structure: External (Cell wall, Envelope, Pili, Flagella, Capsule/Sheath/Prostheca) overview of Internal structures. Importance of staining dyes and stain. Preparation of smear, fixation, mordant, decolourizer. Simple staining (Monochrome and negative staining), Differential staining (Gram's staining), special staining (endospore)	50
Unit 2	**Nutritional requirements and Isolation of Pure culture & media:** Nutritional requirements of microorganism, nutritional types of bacteria. Physical condition required for bacterial growth (pH, temperature, gaseous requirements). Normal Growth Curve. Definition of Pure culture and Axenic culture, Media general ingredients used in media, classification of media on the basis of nature and consistency and use. Techniques for isolation for Pure Culture. Overview of preservation of culture.	50

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	CEE: Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance, etc	50%
2.	University Examination	50%

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Course Outcomes: Having completed this course, the learner will be able to	
1.	The student will learn to identify morphology and nutritional criteria of bacteria And microscopic techniques to study the structure.
2.	To learn the concepts and Isolation of Pure culture, and various media used and laboratory techniques to study microbes.

Suggested References:	
Sr No	References
	Microbiology - Michael J Pelczar ,E.C.S. Chan, Noel R Krieg Microbiology - Prescott, Harley and Klein's Elementary Microbiology – H A Modi Microbiology –R M Atlas General Microbiology Vol 1 andVol 2 -Powar & Daginawala
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B.Sc. (Biotechnology) Sem.- III

Course Code	US03IDBTE02	Title of the Course	Practicals
Total Credits of the Course	02	Hours per Week	04

Course Objectives	1. The students will get a practical approach for isolating and Characterization for identification of various microbes. 2. Learn staining techniques for study of microbes 3. The students will learn various isolation techniques for studying microbes.

Course Content		
	1. Quantitative and Qualitative analysis of Soil and Air micro flora. 2. Study of Pure Culture (*E.coli and Bacillus subtilis*) *3.* Study the effect of U.V on Pigment production of *Serratia marcescens.* *4.* Isolation and identification of Fungi and Yeast. Isolation of microorganism from soil sample by streak/spread/pour plate method. 5. Simple staining-Monochrome and Negative staining 6. Differential staining-Gram's staining 7. Special staining-Endospore staining 8. Effect of pH and temperature on growth of microorganism. 9. Seminar/poster presentation	

Teaching-Assignments, Learning	Lecture, Recitation, Group discussion, Guest speaker, Debate, Seminar, Quizzes.

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2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
	1. To Enumerate microorganism from different sources 2. The students will study Biochemical test and growth characteristic of pure culture. 3. The students will learn isolate nucleic acid from prokaryotes 4. They will learn effect of antimicrobial agents on microbes.

Suggested References:	
Sr No	References 1. Experimental microbiology (Vol. 1 & 2) by Rakesh Patel 2. Molecular cloning (Vol. 1,2,3) by Sambrook et.al

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